

Fluorescence Line Height (FLH)

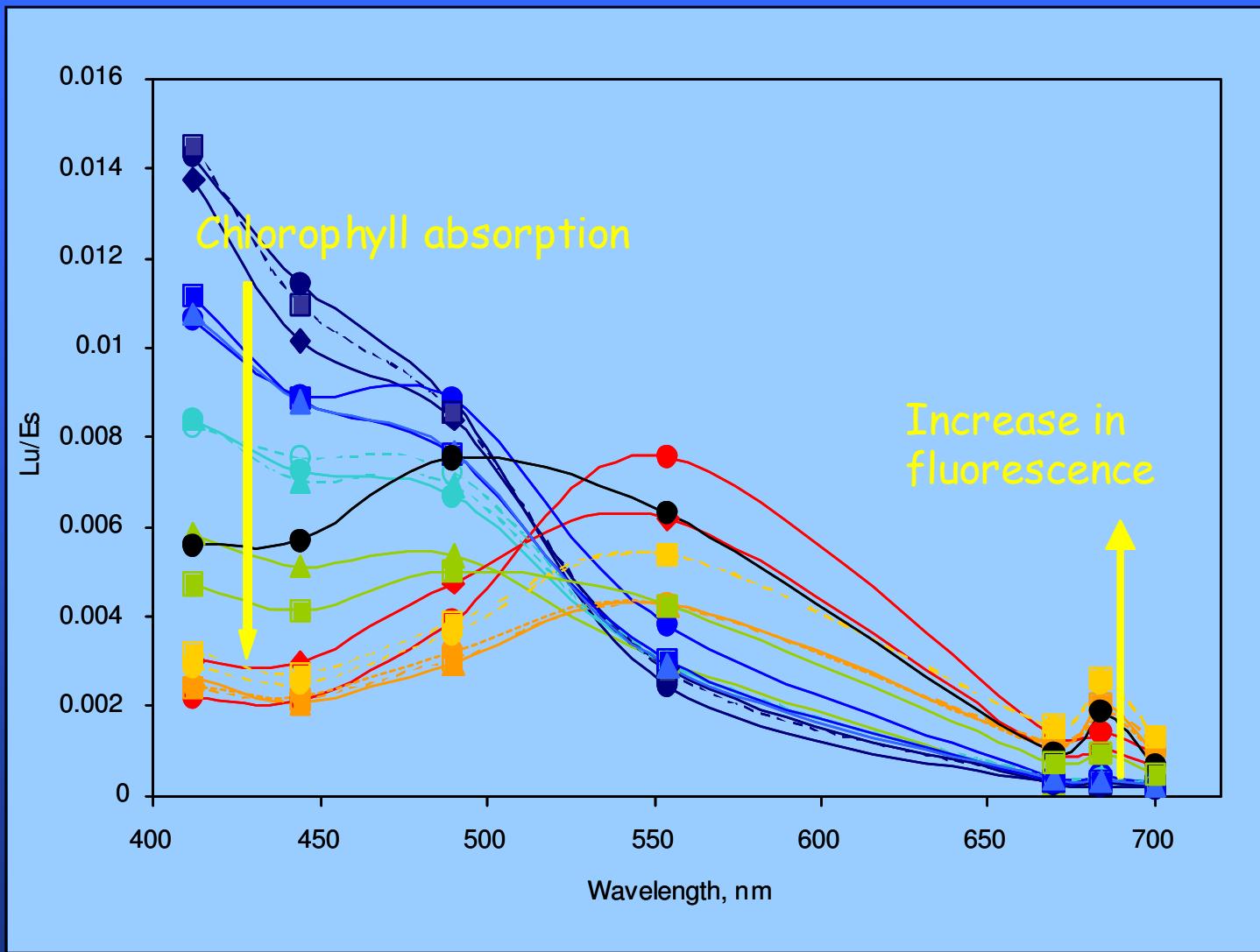
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Mark Abbott,
Jasmine Nahorniak
Oregon State University

Outline

- FLH basic algorithm
- Comparison between field measurements and MODIS FLH
- FLH and [chl a]
- Chlorophyll Fluorescence Efficiency

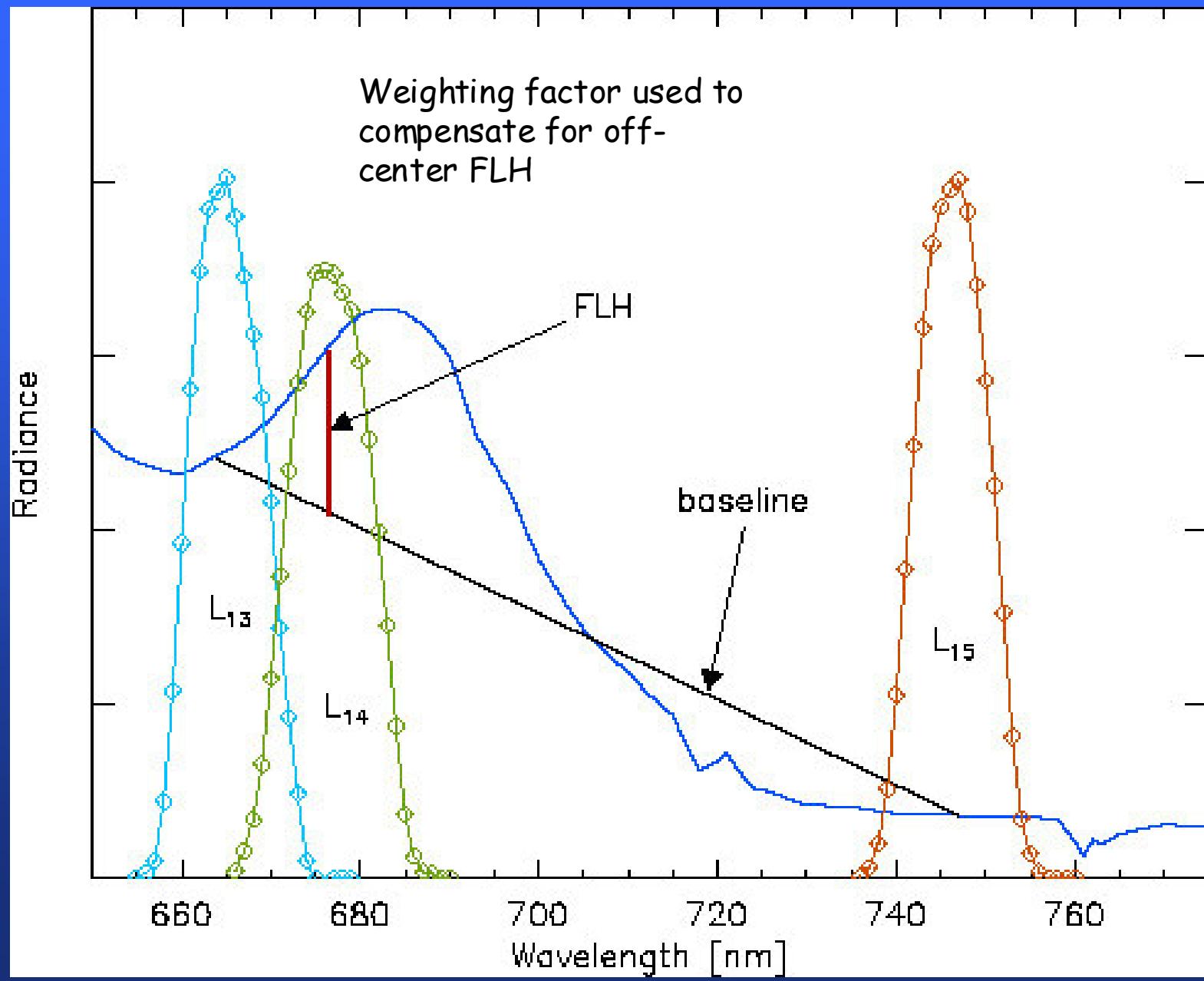
Acknowledgments

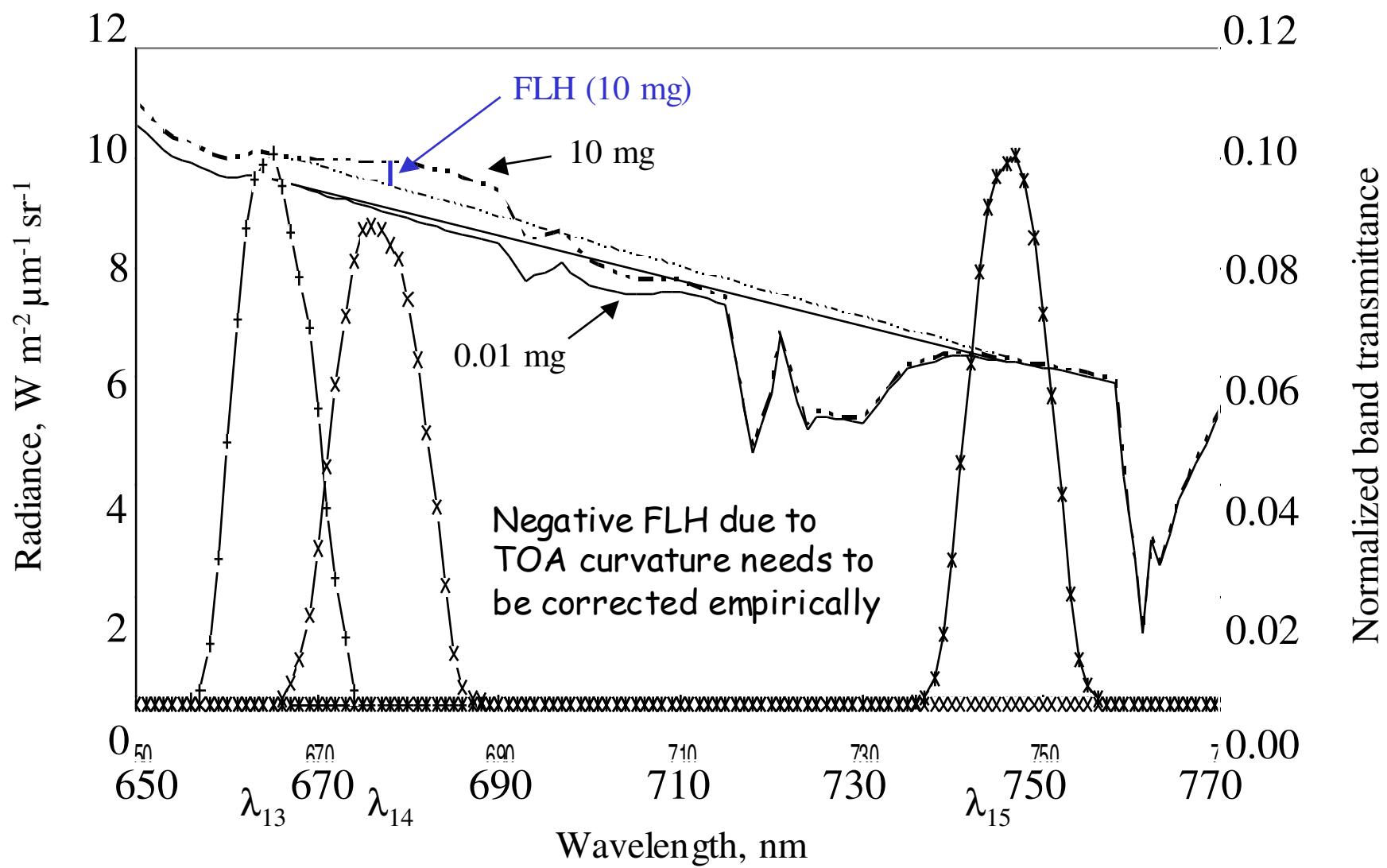
- Mark Abbott, Jasmine Nahorniak (OSU)
- Dennis Clark (NOAA)
- Wayne Esaias, Frank Hoge (NASA)
- Bob Evans, Kay Kilpatrick, Howard Gordon, Ed Kearns (Univ. Miami)
- Ken Carder (USF)
- John Cullen & Yannick Huot (Dalhousie)



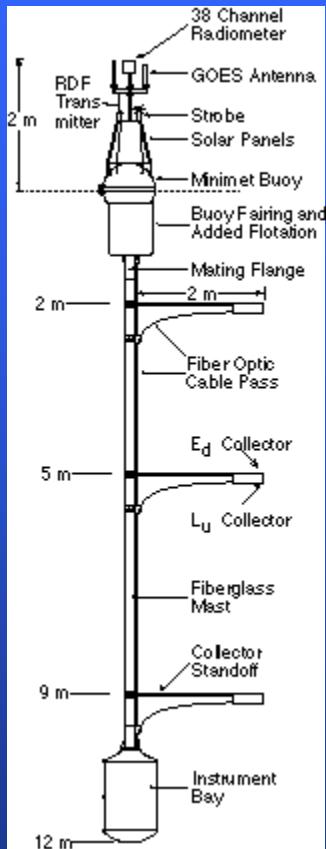
$$F = \text{PAR} \times ([chl] \times a^*) \times \Phi_f$$

MODIS FLH bands: avoid oxygen absorbance at 687 nm





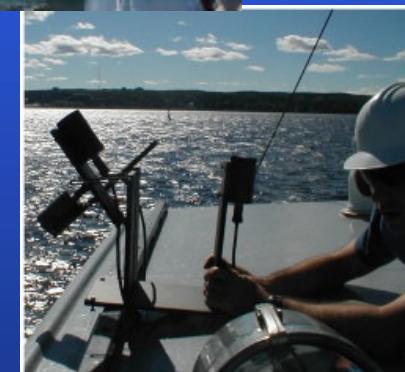
Field Observations

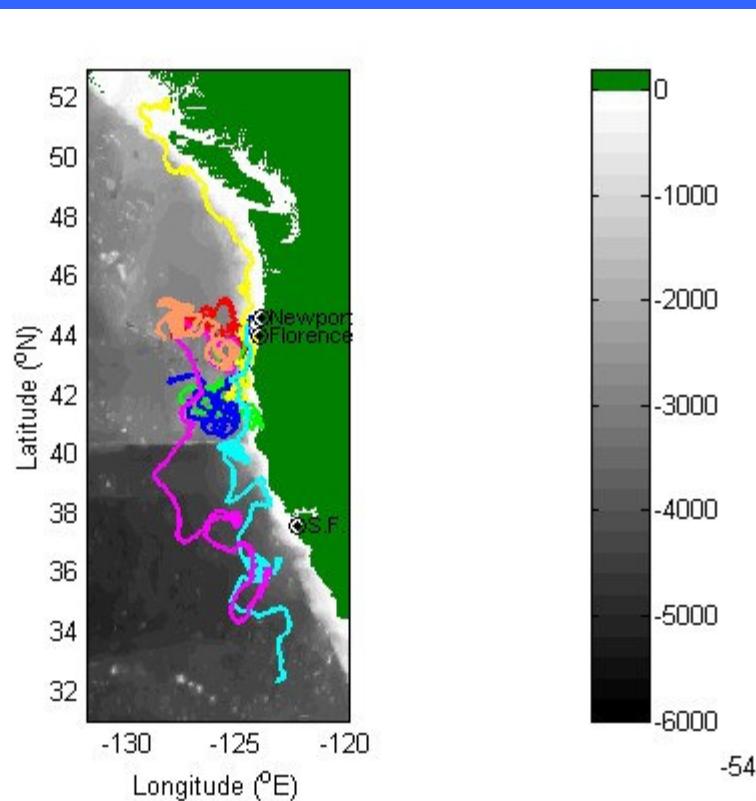


- In situ open ocean
 - MOBY
 - HOT cruises

- In situ Coastal
 - GLOBEC
 - COAST

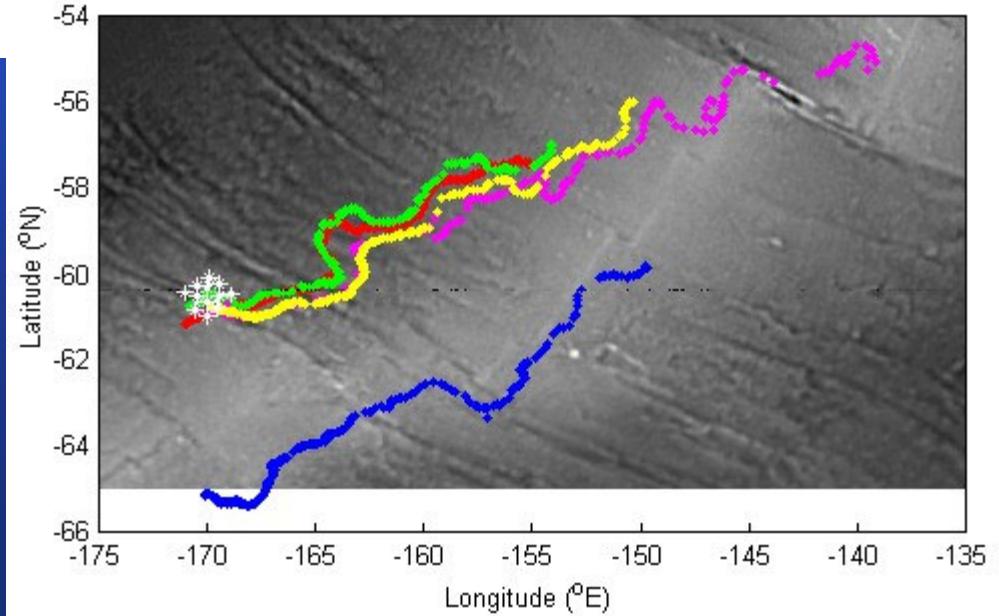
- Southern Ocean

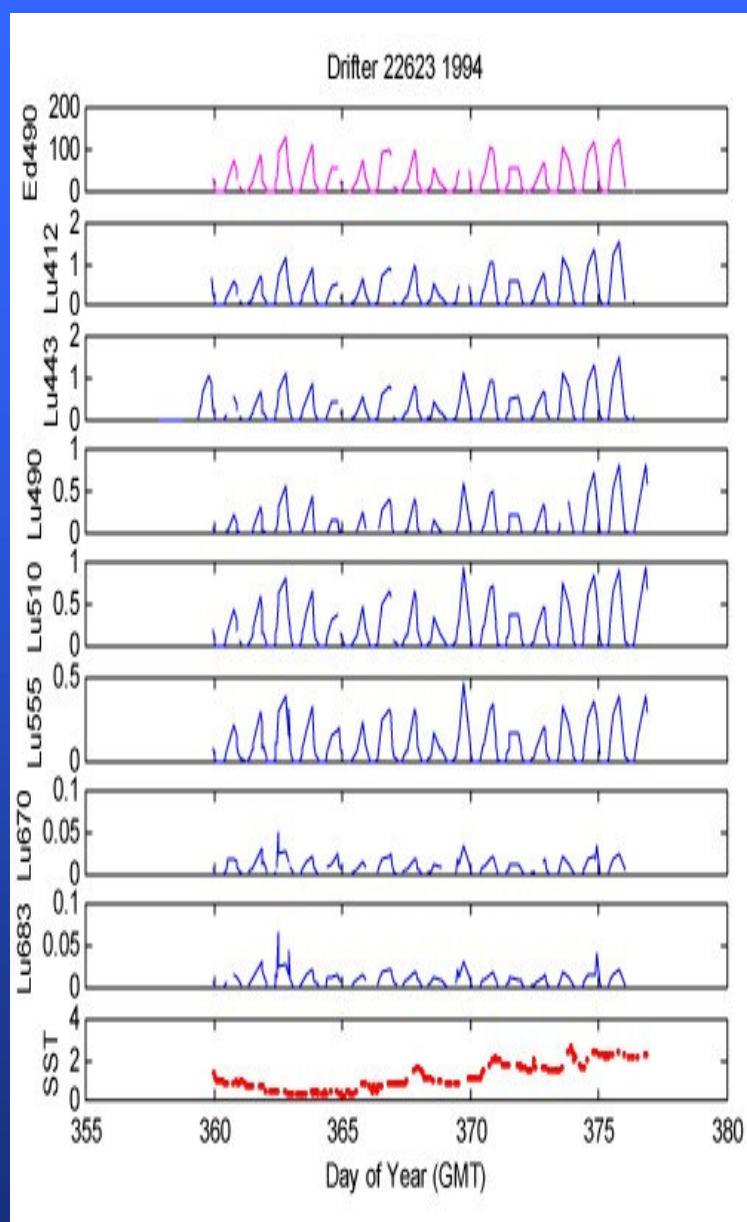
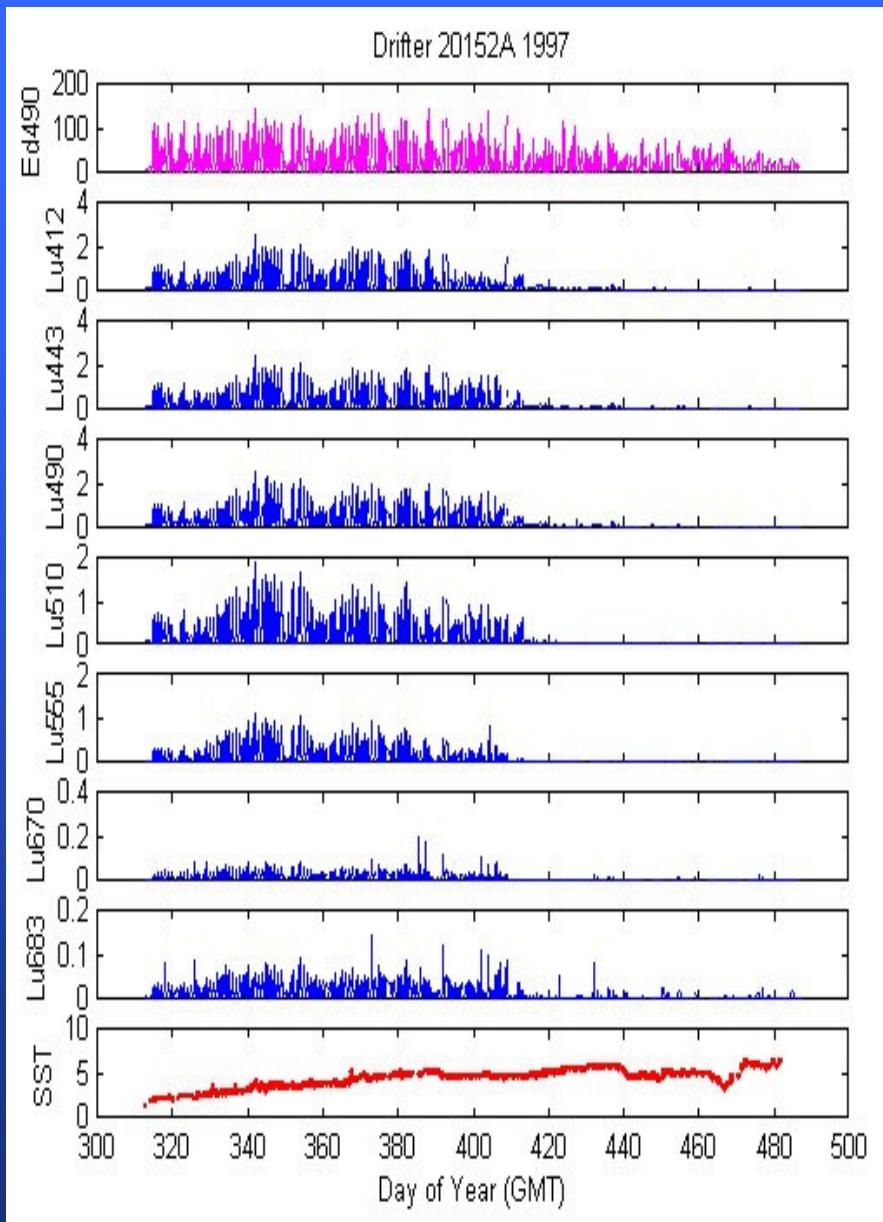


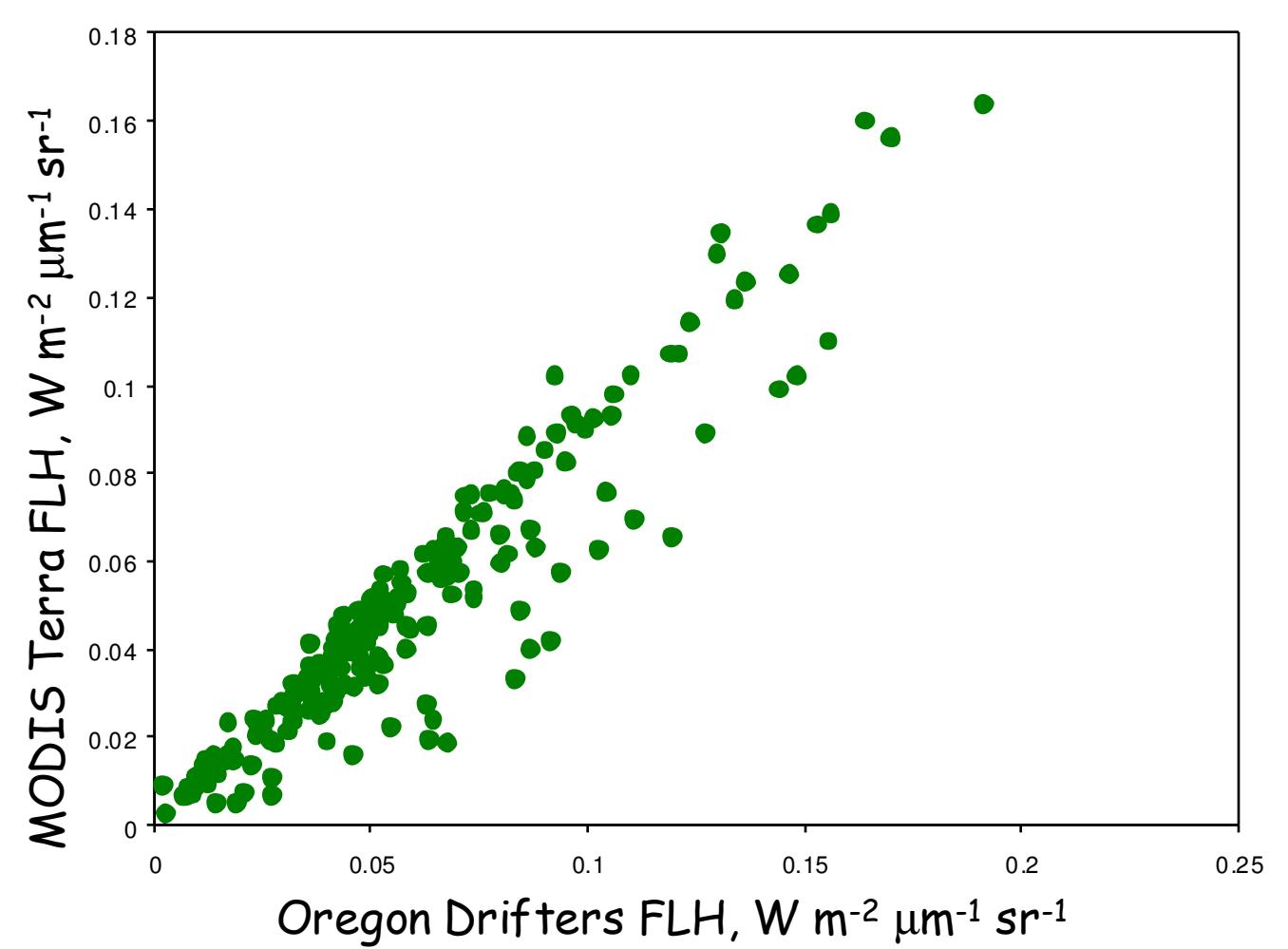


Optical Drifters

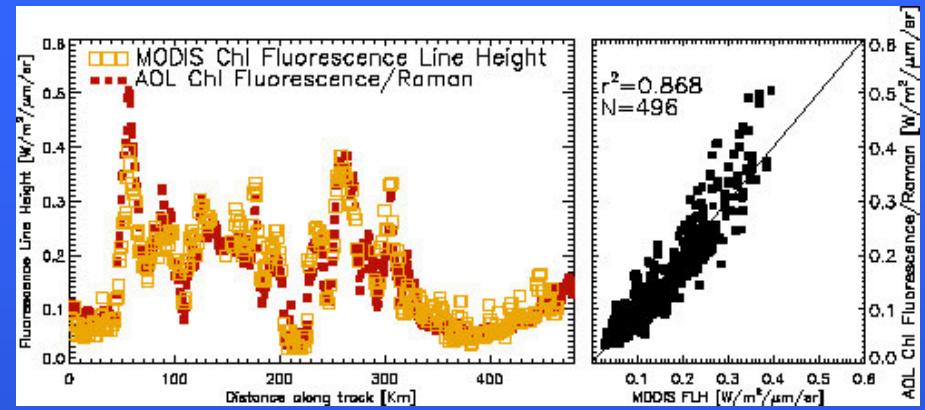
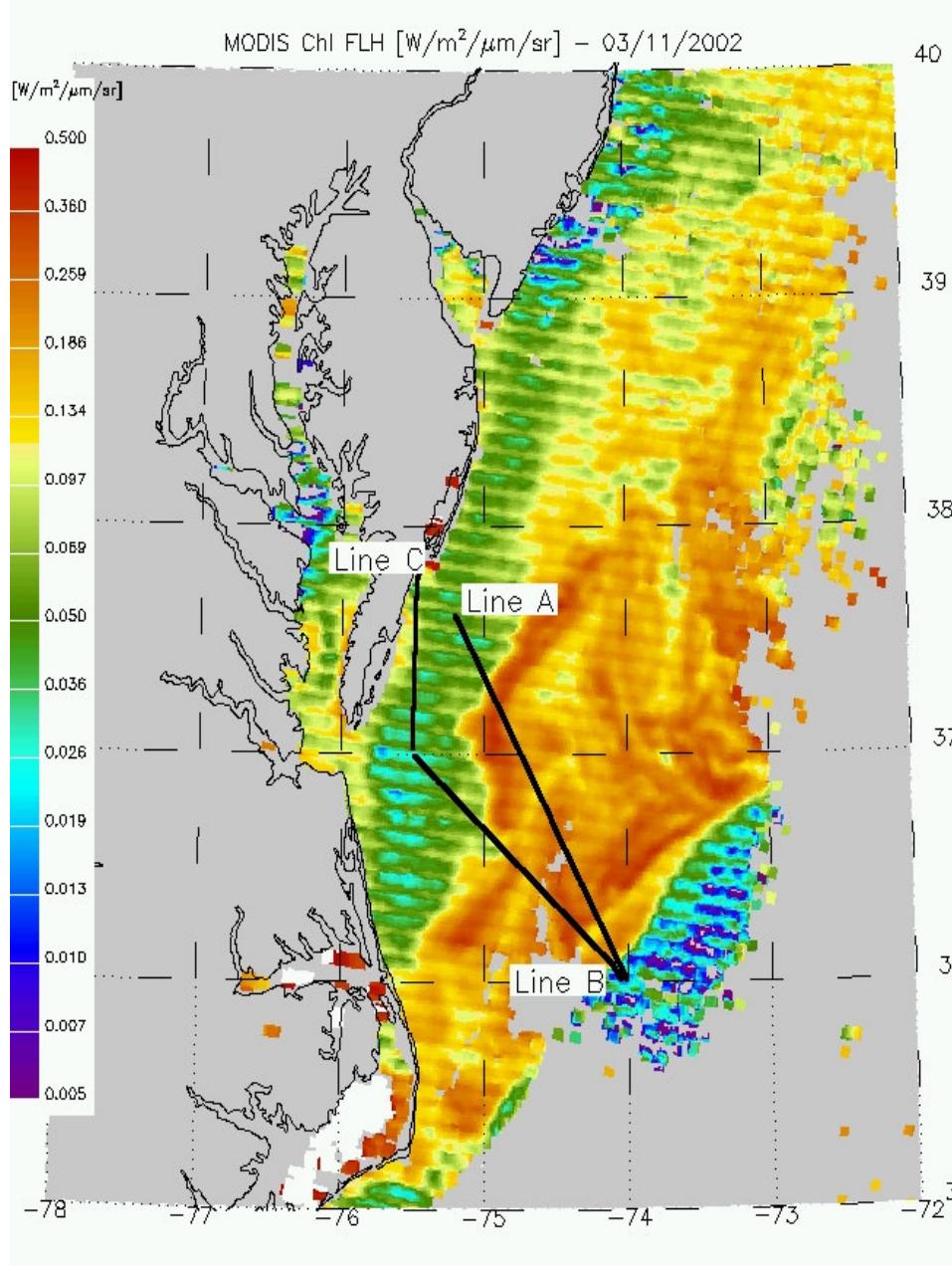
- 29 off Oregon
- 12 in the Southern Ocean
- North Atlantic
(John Cullen's group)



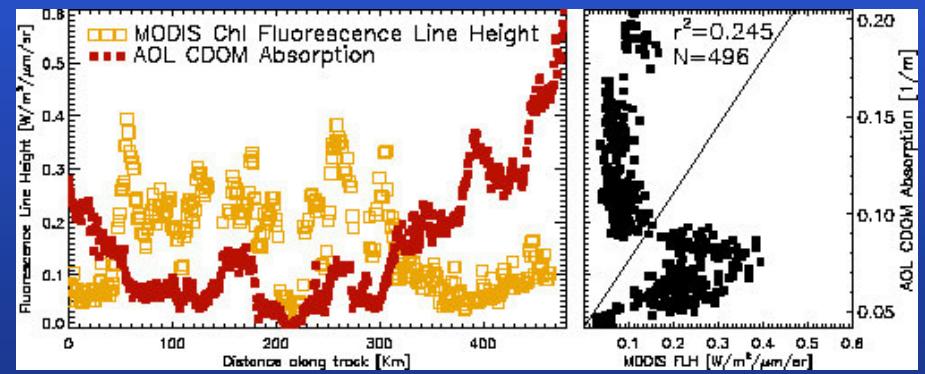




Testing the MODIS FLH Algorithm



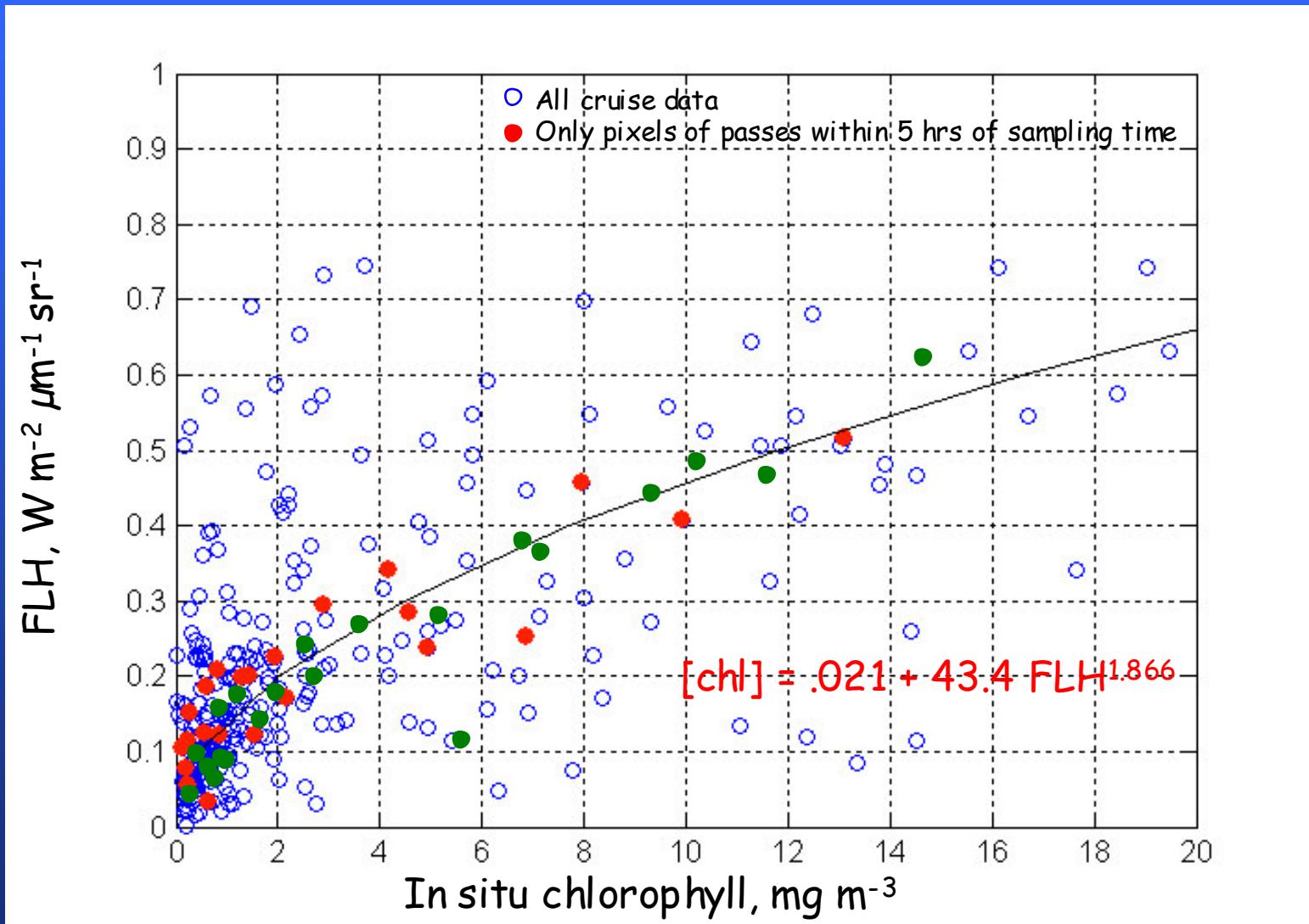
FLH vs.
chlorophyll



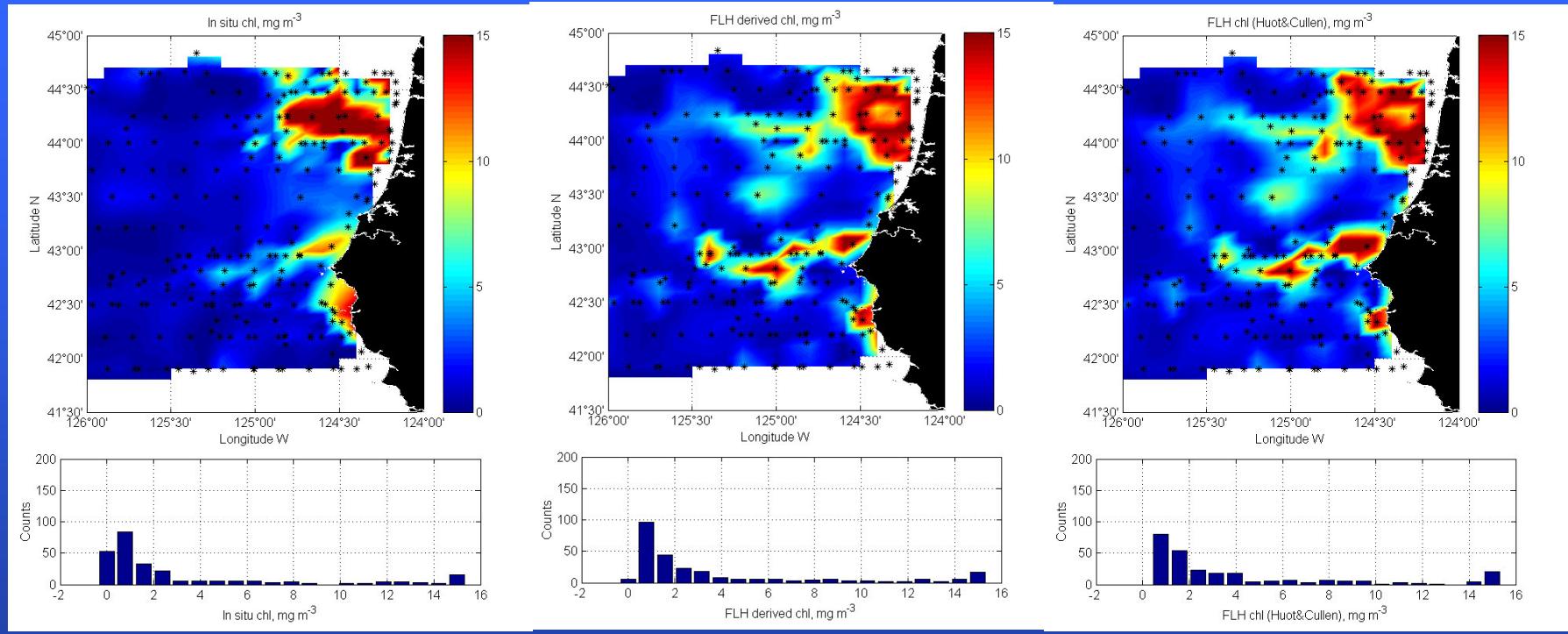
FLH vs.
CDOM

From Hoge et al.

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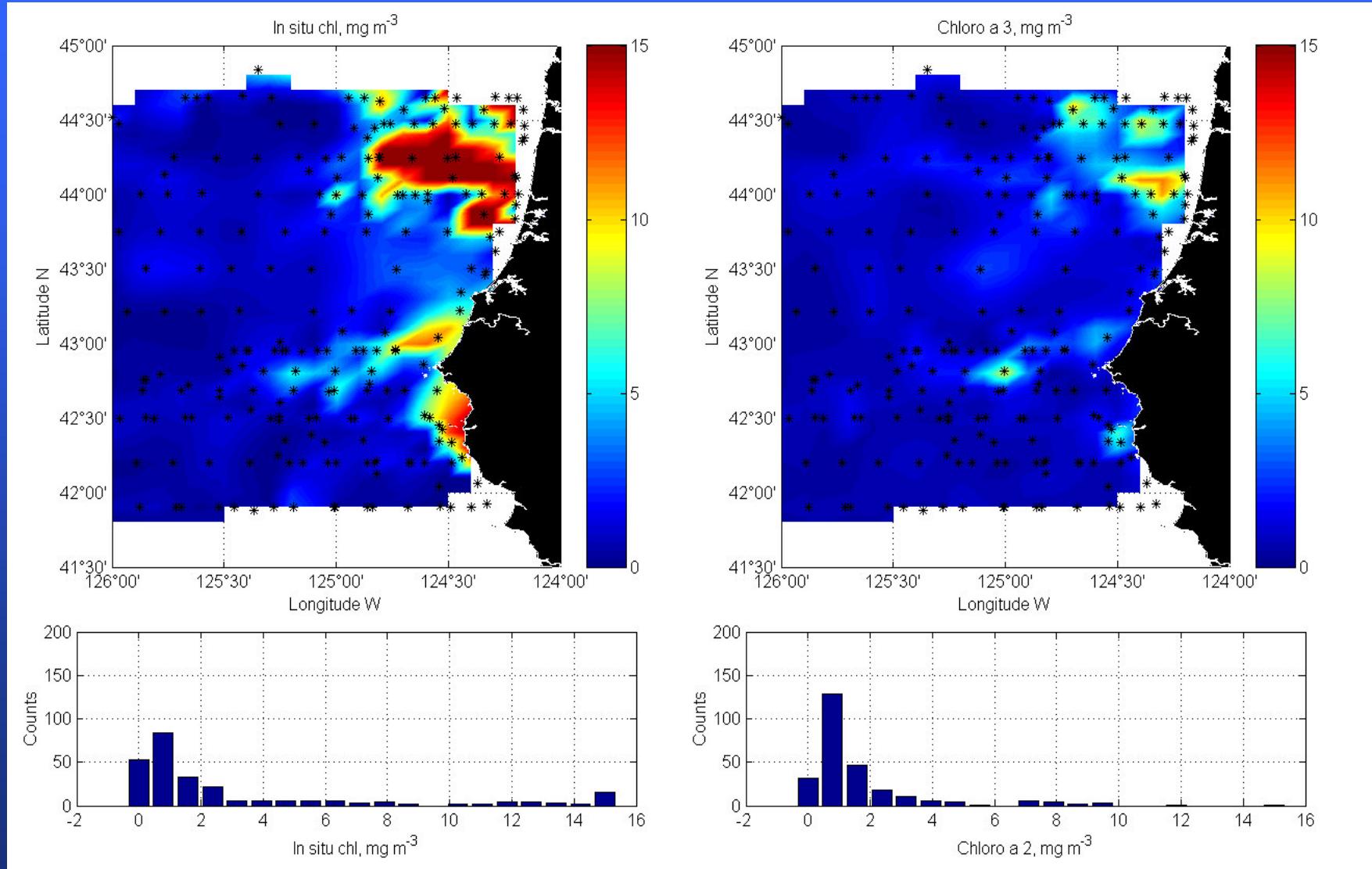
In situ chl

chl_{FLH} empirical
(this study)

chl_{FLH} semi-analytical
(Huot & Cullen
assuming $\phi_f = 0.006$)

- Both FLH derived chl algorithms appear to slightly overestimate chl a fields.
- They do not seem to reproduce the low values observed in situ.
- Some of the differences between in situ and FLH derived could be due to time differences and sampling depth (in situ = 5 m depth)

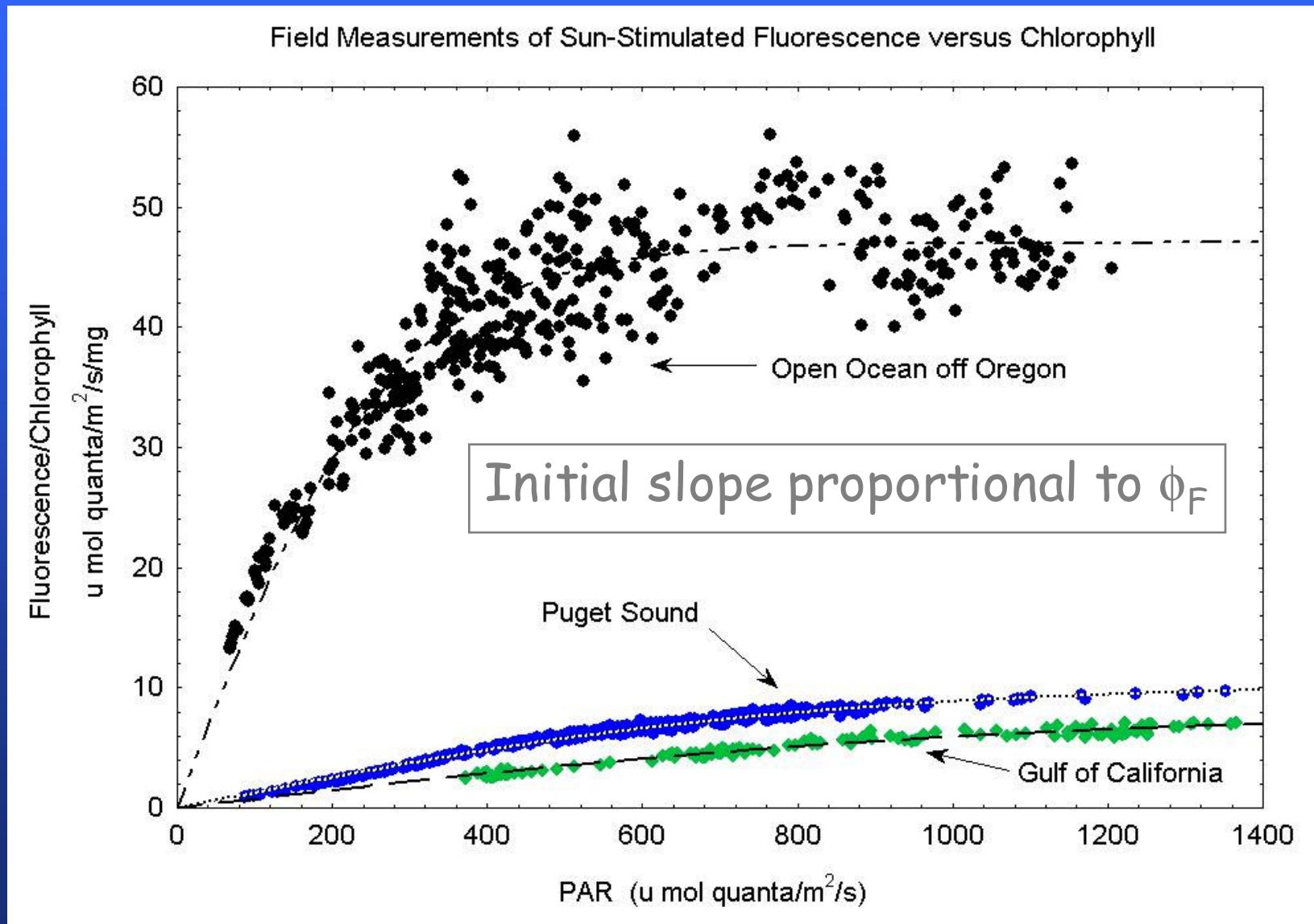
GLOBEC NEP AUGUST 2002 (July 31st - August 19th)



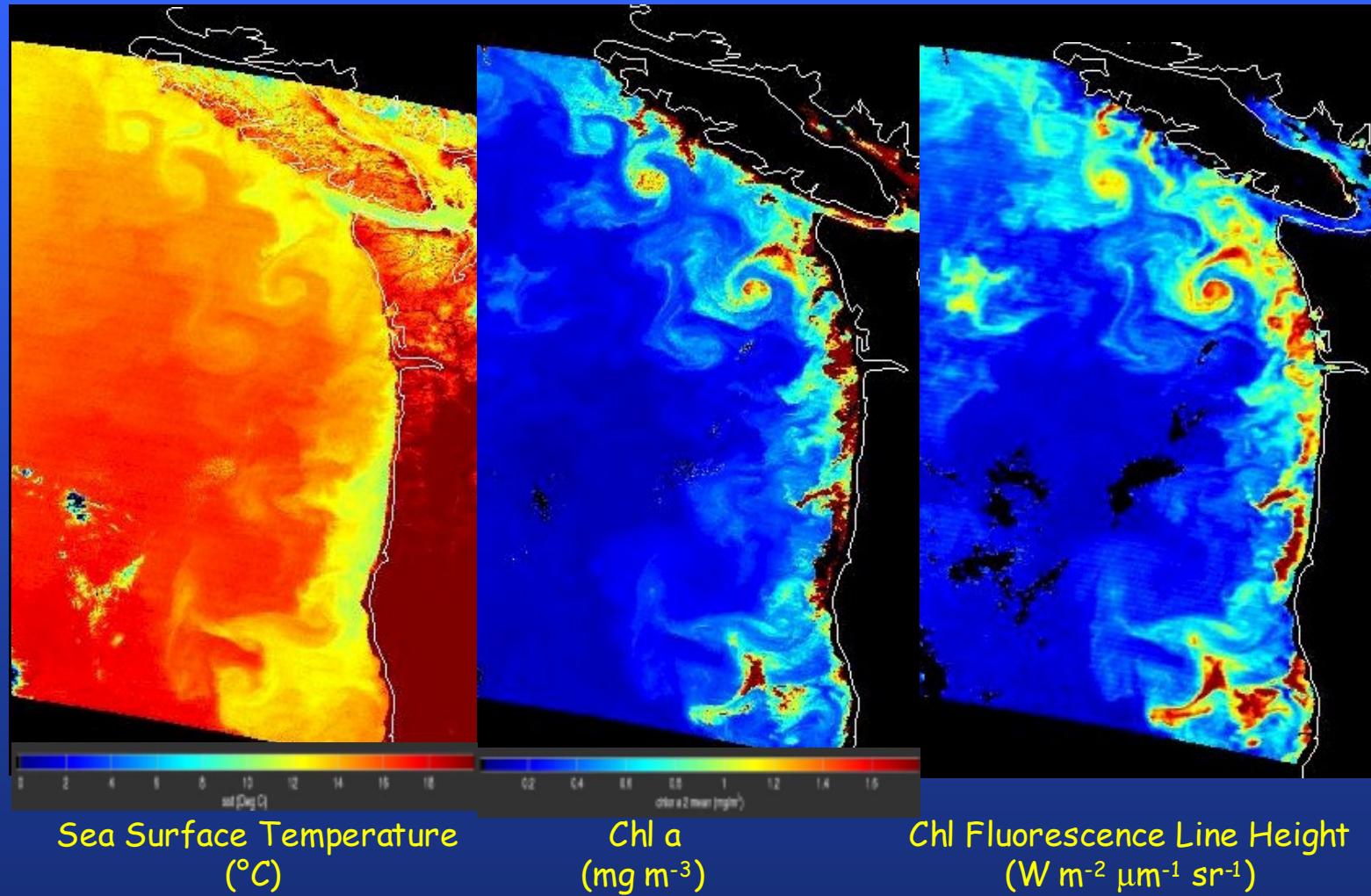
In situ chl a, mg m^{-3}

MODIS chl a_2, mg m^{-3}

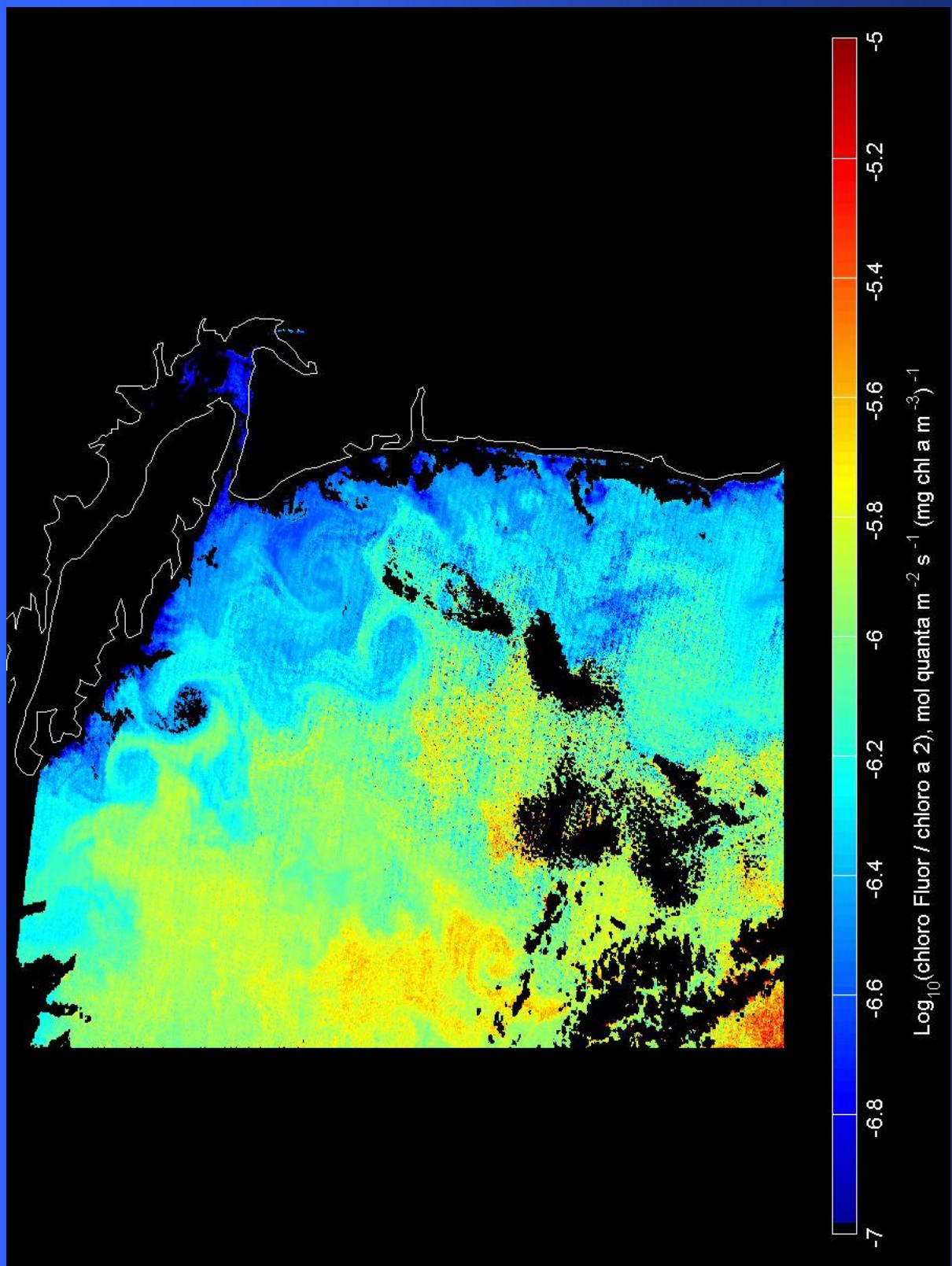
In Situ Observations of F/[chl] suggest it can be a proxy for ϕ_f

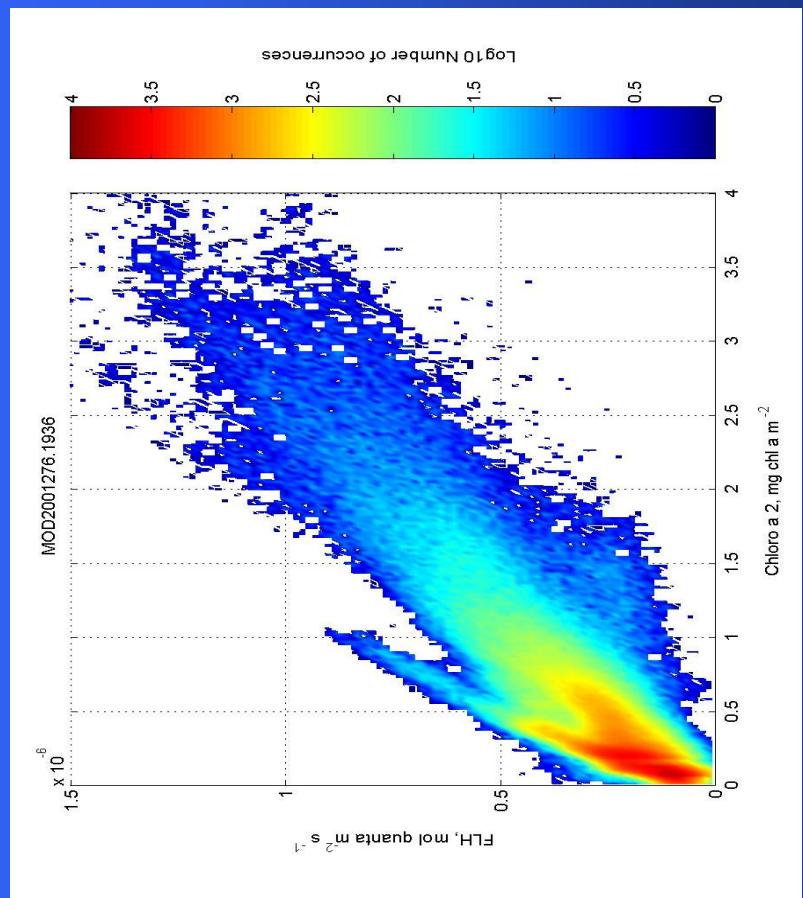
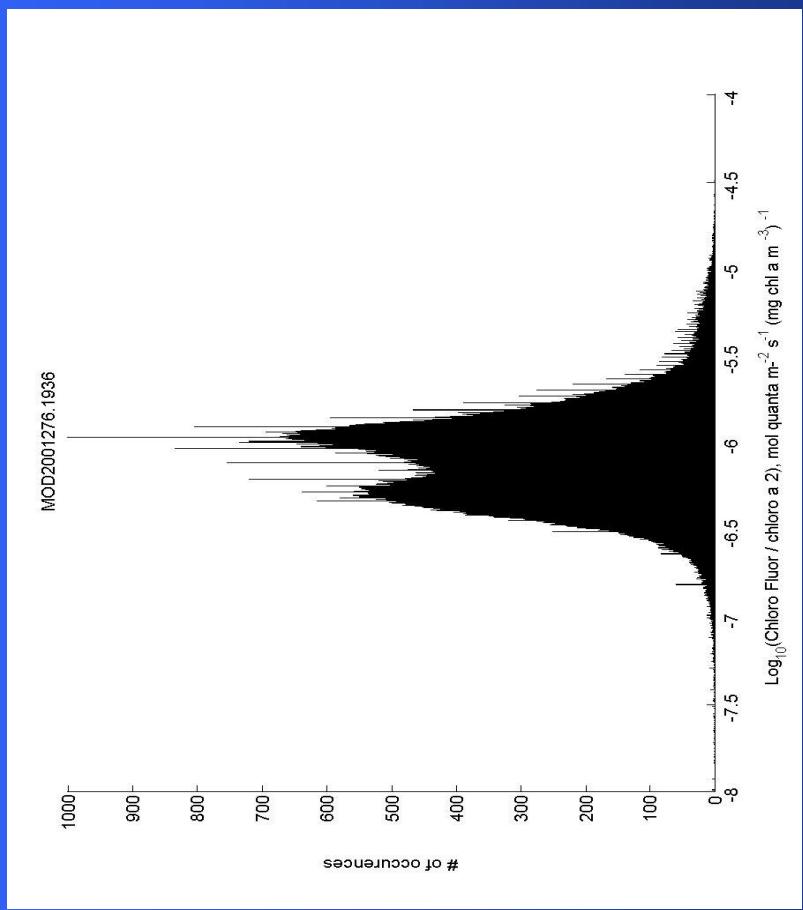


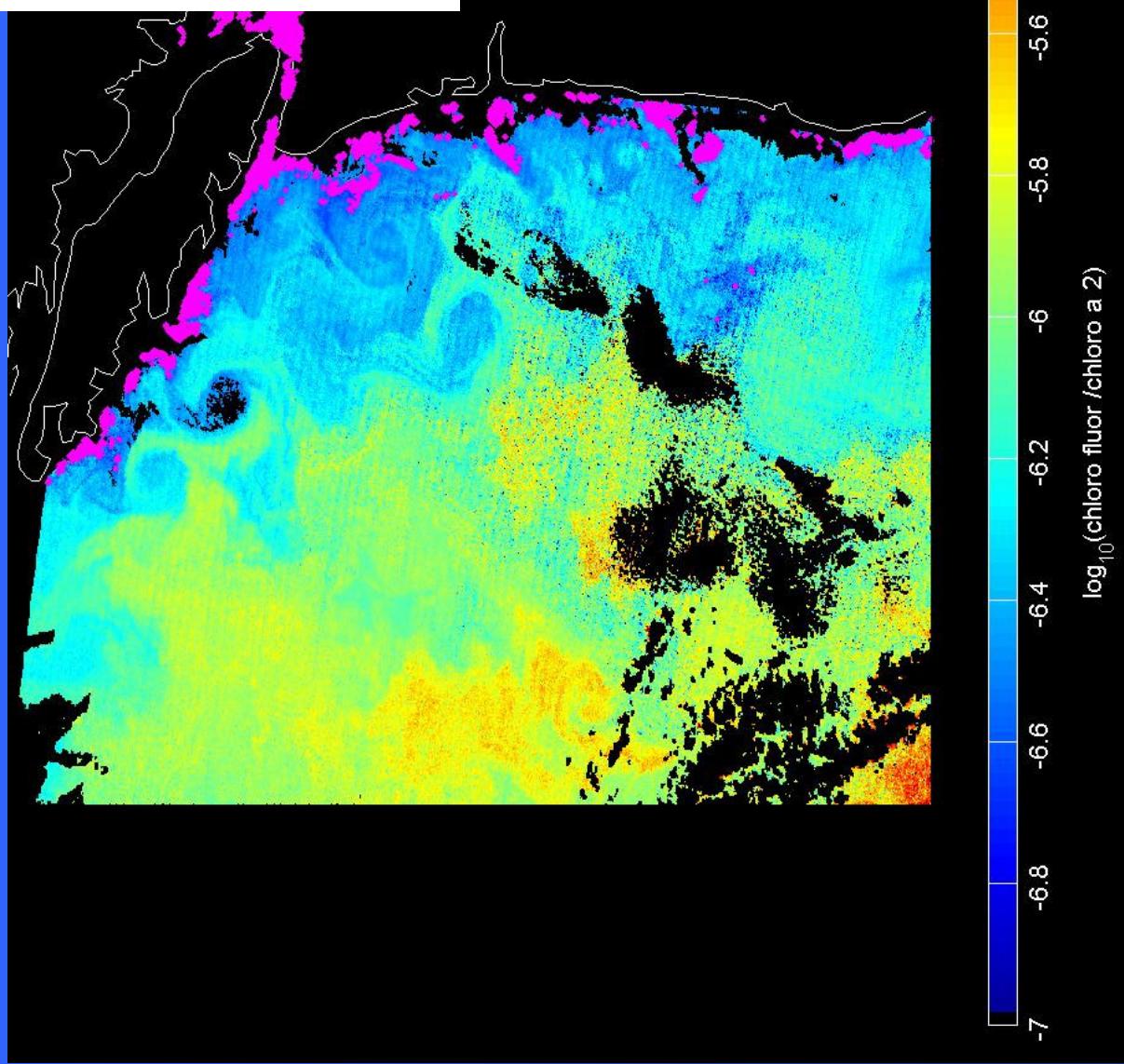
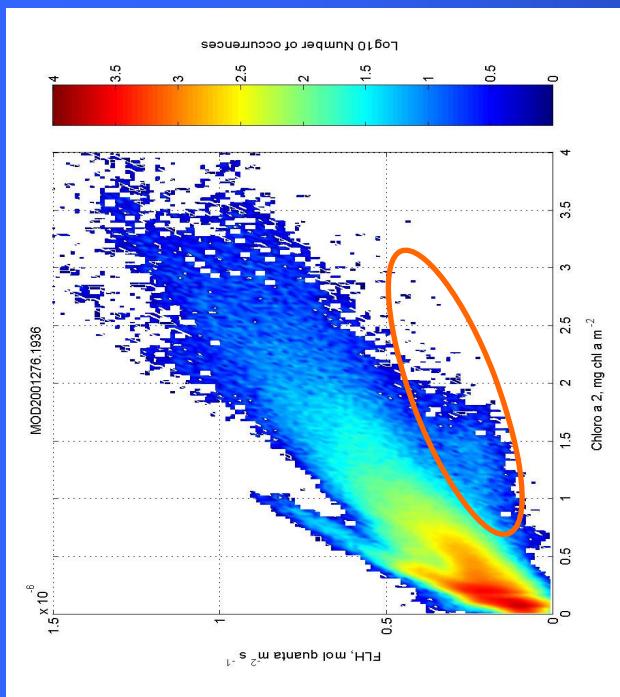
MODIS Terra L2 1 km resolution scene from October 3rd 2001

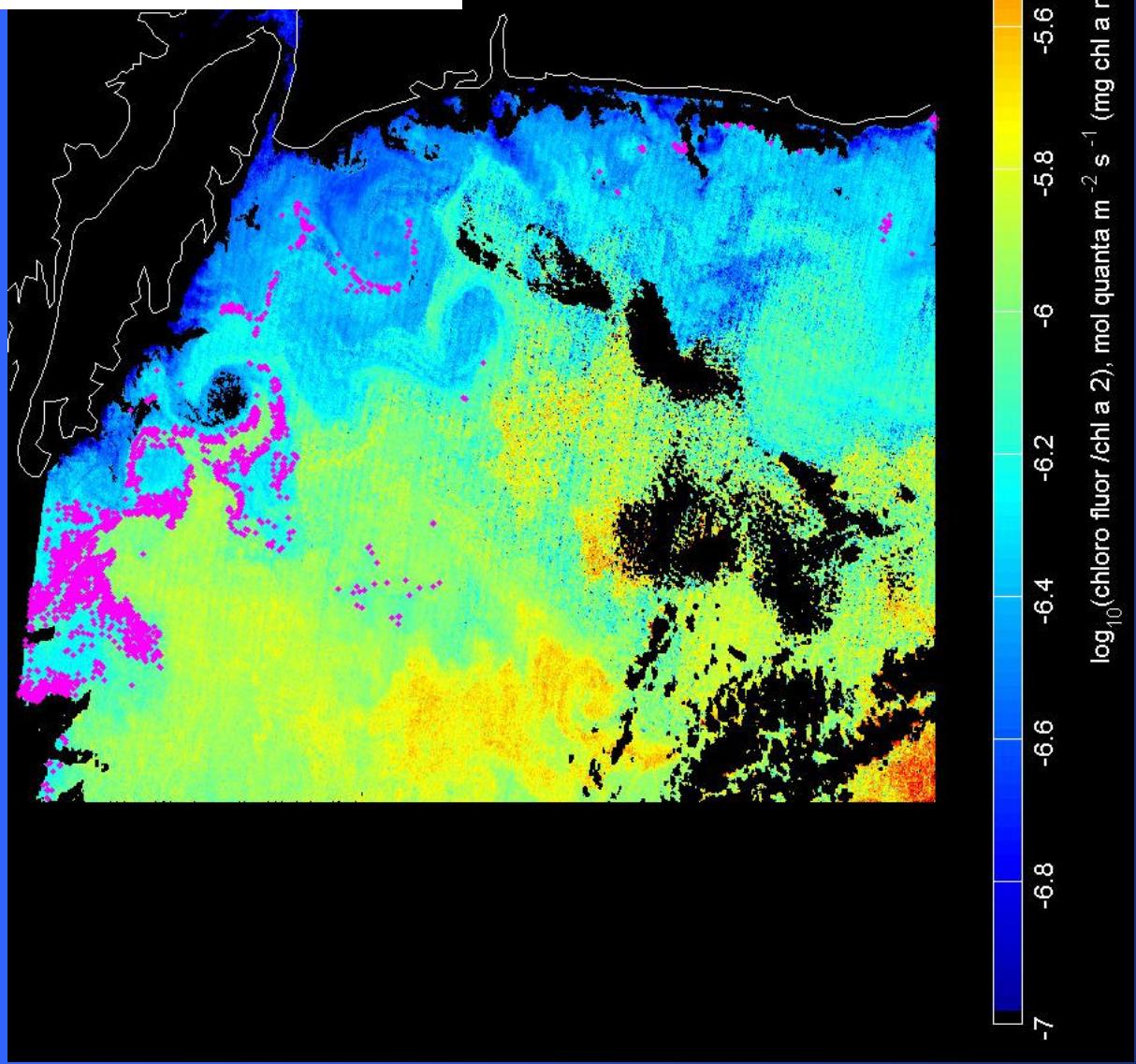
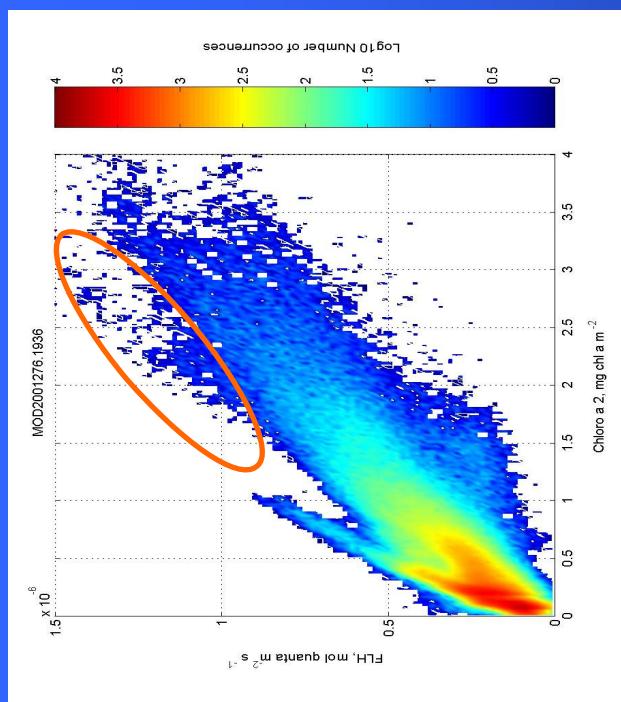


From OSU-COAS EOS DB Station







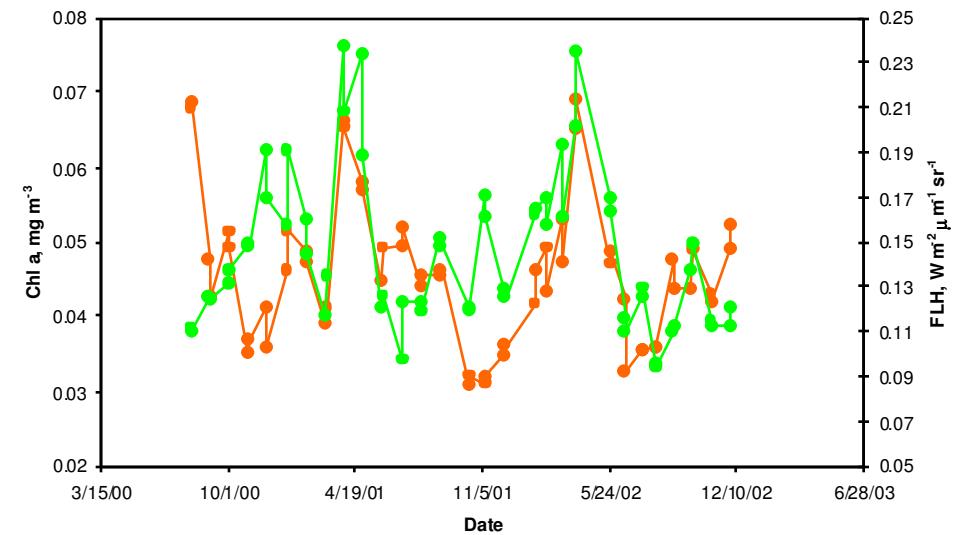
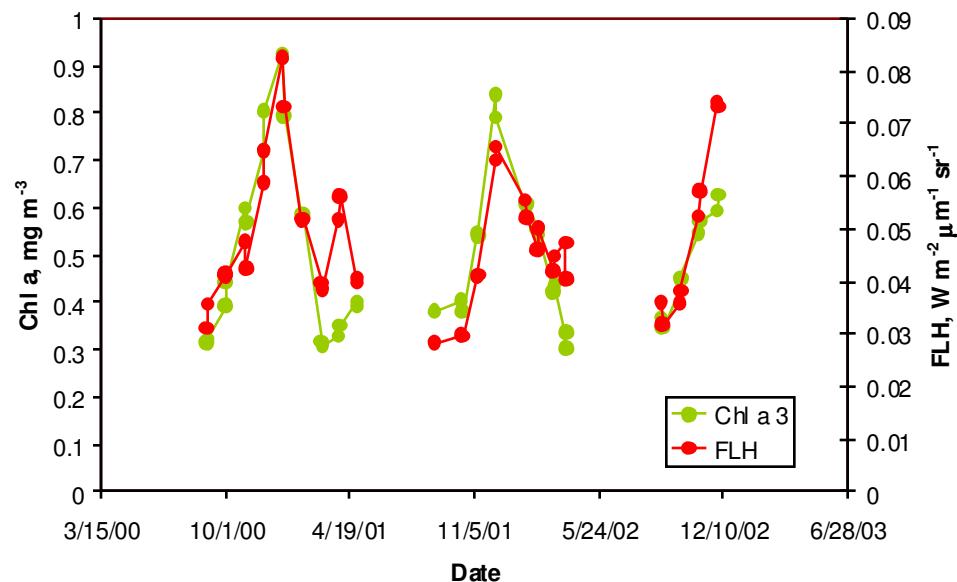


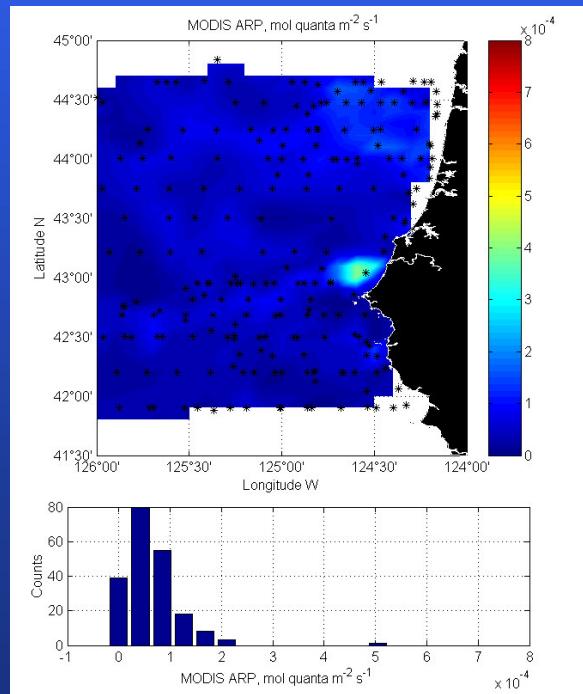
Seasonal patterns of FLH and chl a

Southern Ocean

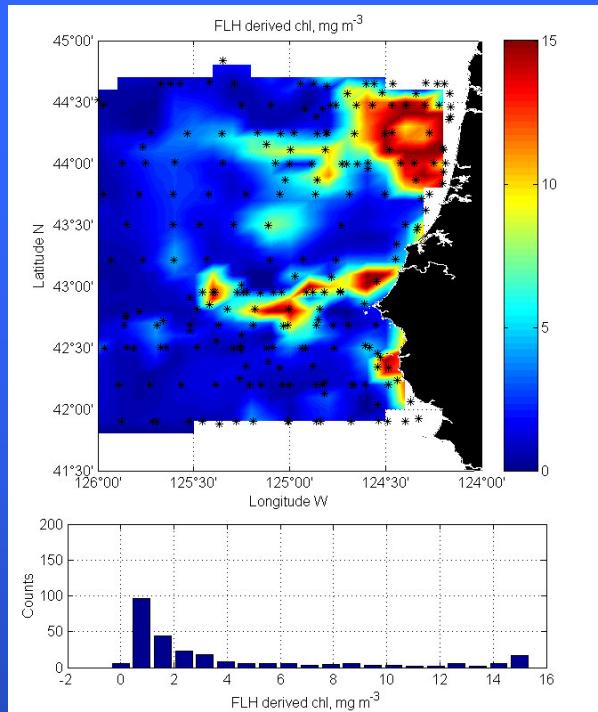
Indian Ocean

Southern Ocean Temp. Test

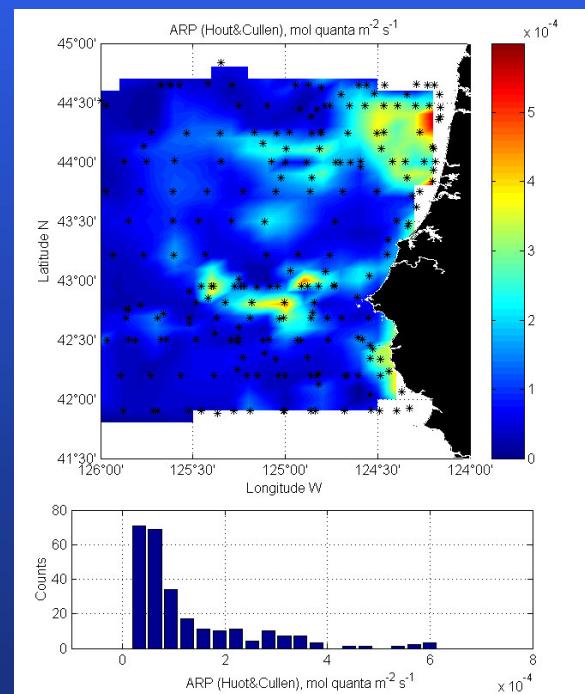




MODIS ARP

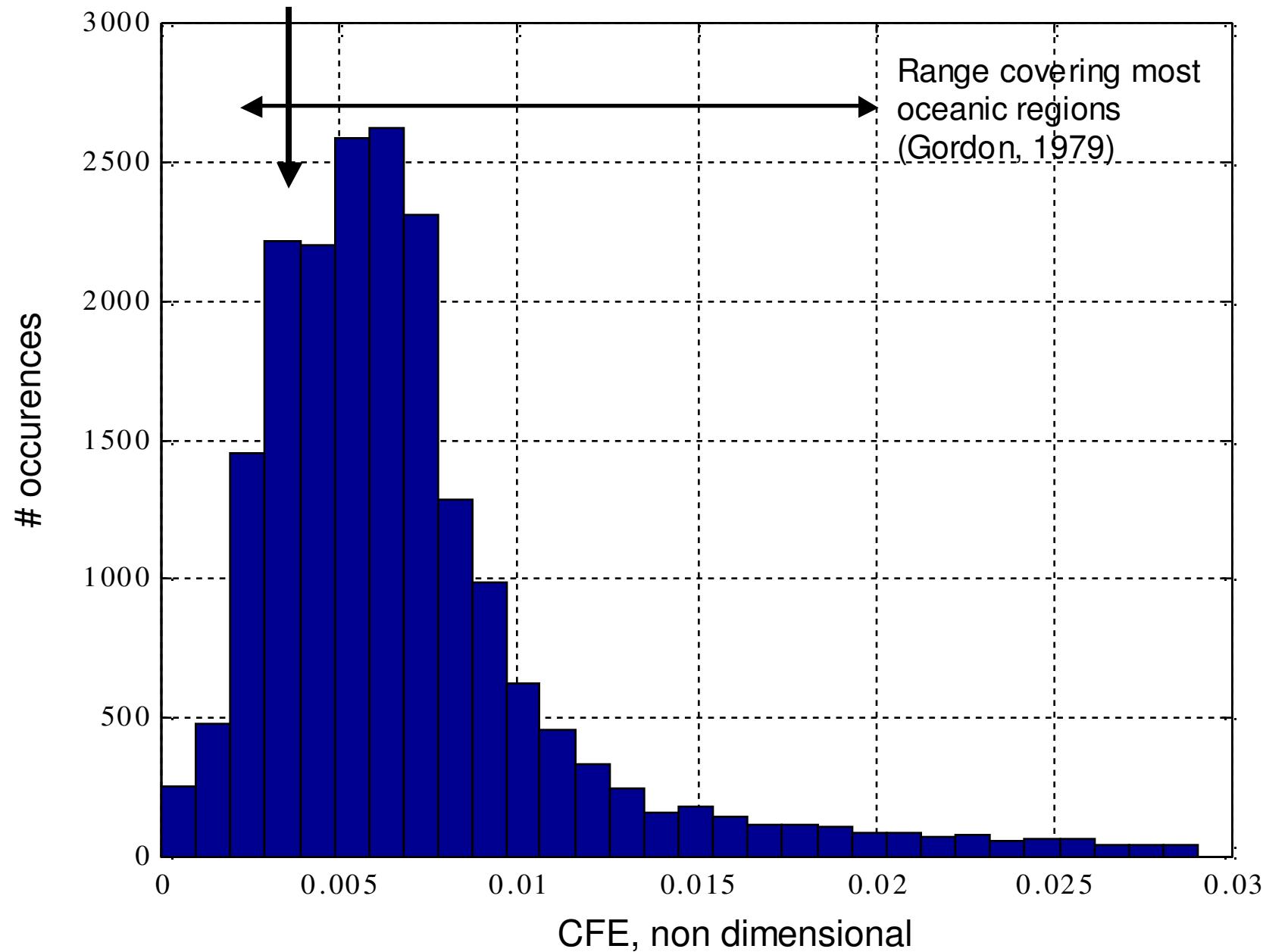


chl_{FLH} empirical
(this study)

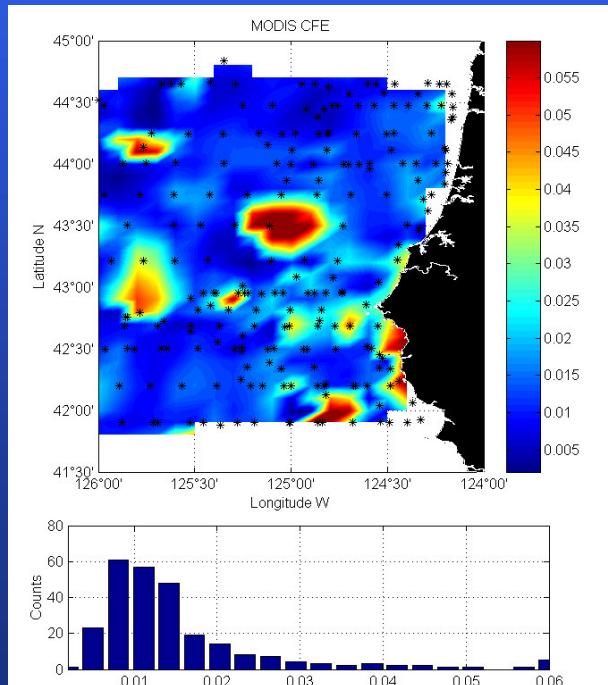


Huot & Cullen ARP
using in situ chl to
Derive an average ϕ_f

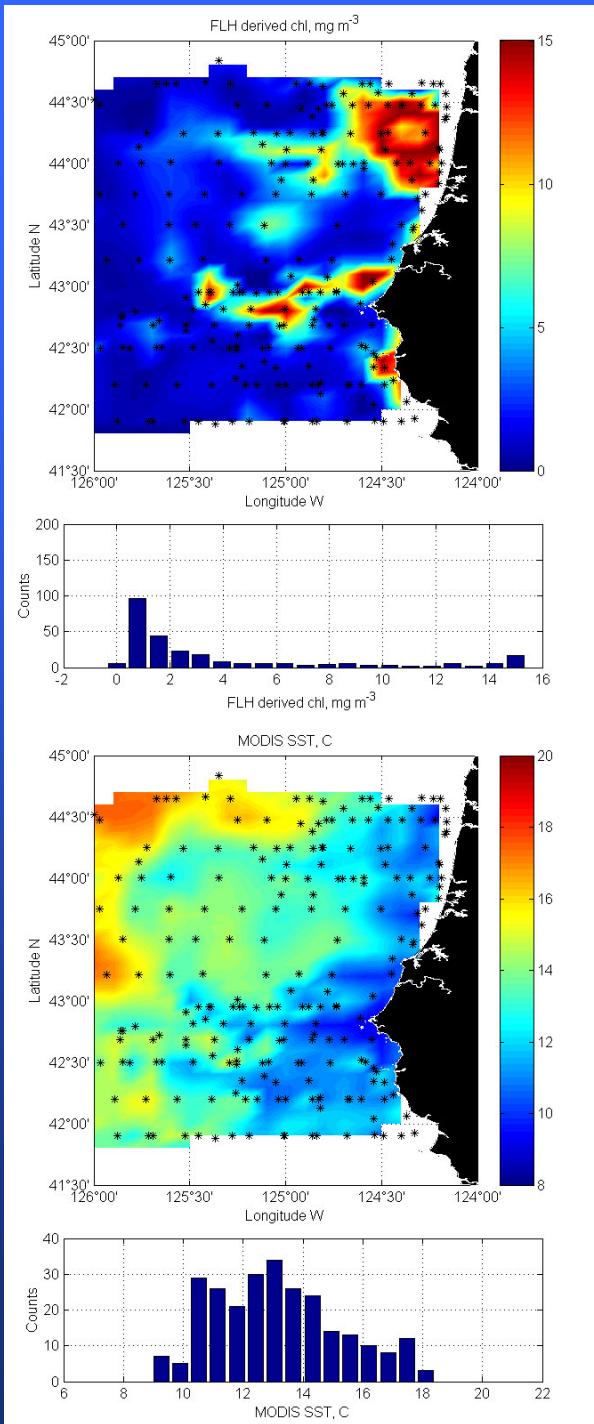
Mean oceanic value according to Fischer and Kronfeld (1990)



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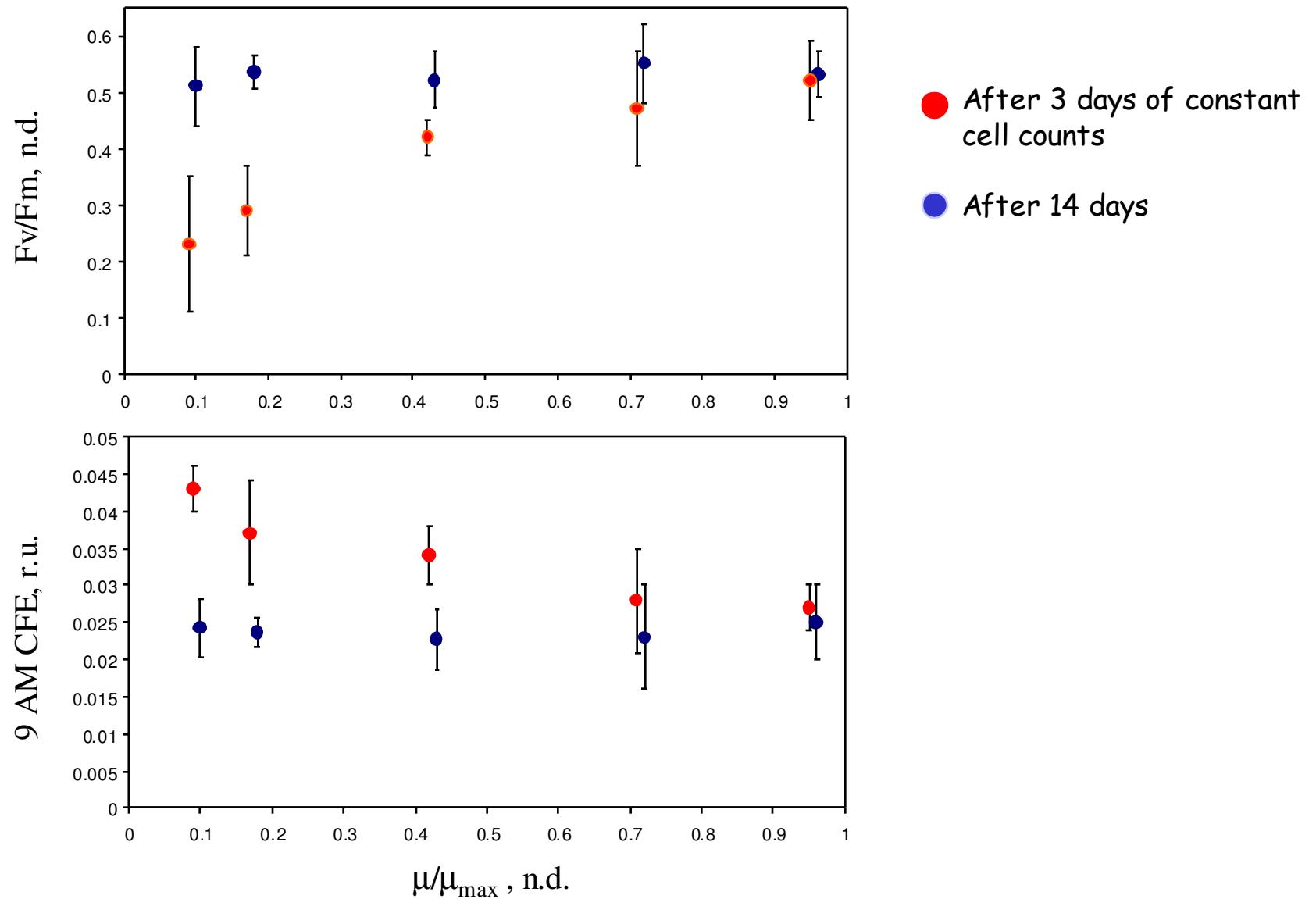


MODIS CFE using
MODIS ARP



MODIS CFE using
Huot & Cullen ARP

Thalassiosira weissflogii
Chemostat results 2001-2002



Where do we stand?

- Field observations suggest that MODIS FLH is a robust product.
- Comparison of $[chl]_{field}$ vs FLH_{MODIS} suggest that FLH may prove of use to derive [chl] in turbid waters. However, and as expected, there is no single relation between FLH and [chl a]. (See also K Carder poster).
- CFE validation requires that of FLH and ARP.
- In order to interpret CFE we need field and laboratory based work that explores the effect of environmental variability and phytoplankton specific composition.

FLH working group

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